

WPI / Thomson

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TI - Laminated tube for motor fuel piping, has layer containing polyamide, and another layer containing semi-aromatic polyamide composition which comprises layered silicate dispersed in polyamide containing aliphatic diamine

IW - LAMINATE TUBE MOTOR FUEL PIPE LAYER CONTAIN POLYAMIDE SEMI AROMATIC COMPOSITION COMPRISE SILICATE DISPERSE ALIPHATIC

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ICCI- B32B1/00; B32B27/34; B60K15/00; F16L11/04

AB - NOVELTY :

A laminated tube has a layer (A) containing polyamide 11 and/or polyamide 12, and layer(s) (B). The layer (B) contains a layered silicate-containing semi-aromatic polyamide composition containing (in weight parts) layered silicate (B2) (0.1-30) dispersed in polyamide polymer (B1) (100). The polymer (B1) contains 50 mol% or more of terephthalic and/or naphthalene dicarboxylic acid and 60 mol% or more of 9-13C aliphatic diamine.

- DETAILED DESCRIPTION :

A laminated tube has a layer (A) and layer(s) (B). The layer (A) contains polyamide 11 and/or polyamide 12. The layer (B) contains a layered silicate-containing semi-aromatic polyamide composition containing (in weight parts) layered silicate (B2) (0.1-30)-uniformly dispersed in polyamide polymer (B1) (100). The polymer (B1) contains dicarboxylic acid unit comprising 50 mol% or more of terephthalic and/or naphthalene dicarboxylic acid and diamine unit containing 60 mol% or more of 9-13C aliphatic diamine.

- USE :

For motor fuel piping (claimed), and also used as oil tube, evaporation tube, tube for conveying refrigerants, cooling water, washing liquids and medical chiller materials, coating material dispersion tube, floor heating tube and tube for fire extinguishing equipments.

- ADVANTAGE :

The laminated tube has excellent alcohol-gasoline permeation prevention property, high strength, interlayer adhesive property, low-temperature impact resistance and excellent heat resistance.

- DESCRIPTION OF DRAWINGS :

The figure shows the cross-section view of laminated tube.

a-c : layers (A-B)

- INORGANIC CHEMISTRY :

Preferred Properties: The layered silicate has length 0.002-1  $\mu$ m per side, thickness of 6-20 $\text{\AA}$  and interlayer distance of 20 $\text{\AA}$  or more.

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- POLYMERS :

Preferred Layers: The laminated tube preferably has layer (A), layer (B) and at least 3 layers (C) containing polyamide 11 and/or polyamide 12, or polyamide 6. The layer (C) is arranged as innermost layer and layer (A) as outermost layer. The layer (B) is arranged as inner layer with respect to layer (A). Preferred Property: The innermost layer has electroconductivity. Preferred Composition: The polymer (B1) contains 60 mol% or more of 1,9-nonane diamine and/or 2-methyl-1,8-octane diamine, or 1,12-dodecane diamine, and 50 mol% or more of terephthalic acid and/or 2,6-naphthalene dicarboxylic acid. Preferred Process: Each layer is formed by co-extrusion.

- EXAMPLE :

A polyamide resin composition (A) (in weight%) containing polyamide 12 (85), impact improvement material (10) and plasticizer (5) was prepared. A layered silicate-containing semi-aromatic polyamide composition (B) having layered silicate content of 2 wt.% and relative viscosity of 2.5, was prepared using epsilon-caprolactam, 12-amino dodecanoic acid and montmorillonite. A resin composition (C) containing polyamide 6 (75), impact improvement material (10) and plasticizer (15) was prepared. The compositions (A-C) were supplied to a tri-layered tubular molding machine and separately melted at 250[deg]C, 290[deg]C and 260[deg]C, respectively. The discharged fused resin was molded into a tubular product and cooled. A laminated tube having structure of A/B/C layers with respective thickness of 0.4/0.2/0.4 mm, internal diameter of 6 mm and outer diameter of 8 mm, was obtained. The laminated tube was found to have excellent alcohol-gasoline permeation prevention property, interlayer adhesive strength and low-temperature impact resistance by SAE J-226.